THE FUTURE PHOTONICS HUB
"BRIDGING THE GAP"

Dr Andrew Rickman
Chairman & CEO
13 September 2016

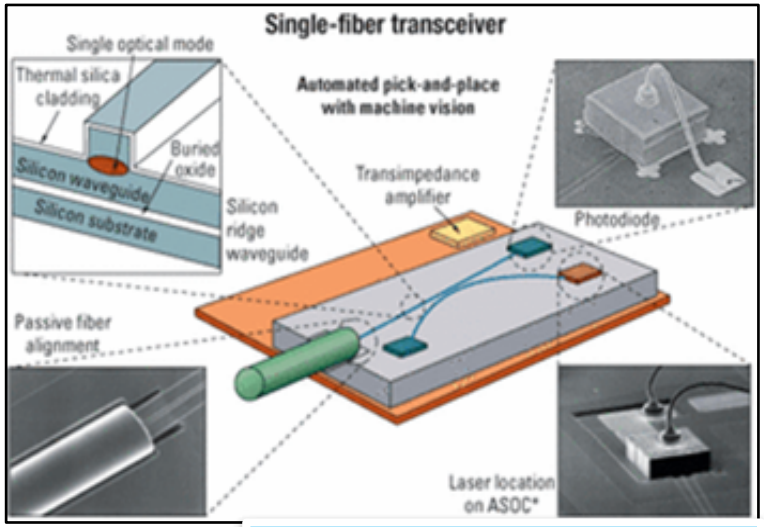
Rockley Photonics:
Scaling Cloud Datacenters with Photonic Packet Switching

Background

- **Rockley Photonics was founded in mid 2013 by a team with proven commercial track record**
- **Our investor group achieved more than a ten times return from Bookham Technology's Nasdaq IPO and four times from Kotura Inc.'s trade sale.**

Bookham™

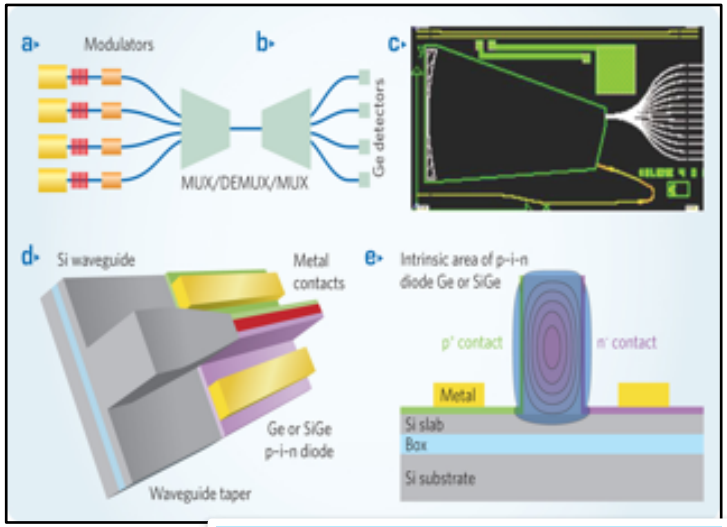
- 1988 - Andrew Rickman founds Bookham Technology
- 1989 - Bookham begins collaboration with Prof Graham Reed and Prof Bernard Weiss, University of Surrey
- 1993 - University of Southampton and Rutherford Appleton Laboratory process first silicon photonics devices
- 1998 - Intel and Cisco invest
- 2000 - Successful IPO on NASDAQ led by Goldman Sachs
- 2016 - Leading fiber optics company now called Oclaro (Nasdaq: OCLR)



Bookham Volume Products:
- Access Bidi Transceivers
- 40 Channel AWG Mux/Demux
- High Speed VOA

KOTURA

- 2006 - Kotura continues technology commercialization Dr Andrew Rickman, Chairman and largest shareholder
- 2012 – PMC invest
- 2013 - Acquired by Mellanox (Nasdaq: MLNX)



Kotura Volume Products:
- High Speed VOA
- QSFP LR Transceiver
- Echelle Mux/Demux

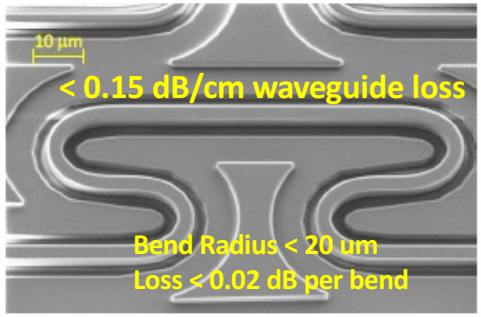
Rockley Photonics Introduction

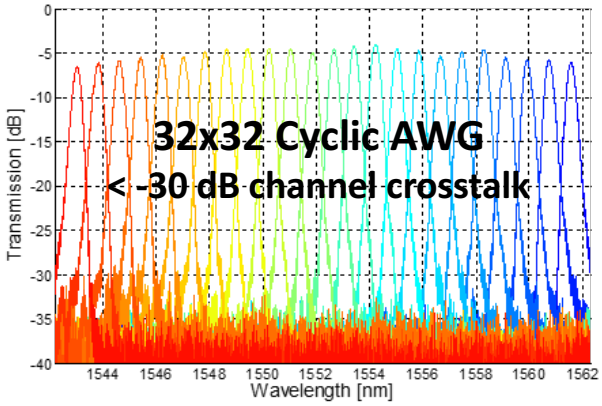
- Mission: Developing massively scalable optical packet switching solutions
- Initially targeting the burgeoning hyper scale cloud data center market
- Unique combination of silicon photonics (state of the art low loss platform) with CMOS and breakthrough RPFabric architecture
- Highly experienced management team with multiple successes in silicon photonics and CMOS
- Well funded global team of more than 62; based in Pasadena CA, Oxford UK, Helsinki Finland (Finnish government supporting silicon photonics volume manufacturing)
- Silicon photonics research and development support, University of Southampton - Photonics Hub
- Business model selling chipsets and reference design IP, fabless
- Strong partner eco system in place
- Strong and growing IP position

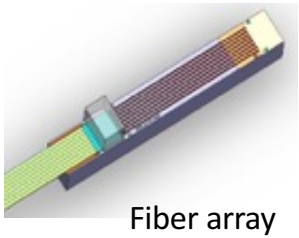
State-of-the-Art Low Loss 3 µm Silicon Photonics Platform

Low loss, low power, high speed 3µm waveguide Si photonics platform:

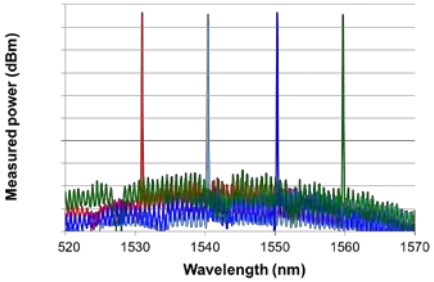
- Low loss, polarization independent, waveguide platform
- AWGs for high density WDM routing
- Monolithically integrated high-speed low-power modulators and photo-diodes
- Advanced integration: flip-chip CMOS integration, low cost attach of III/V bars for WDM laser arrays
- Low cost, low loss fiber attach and packaging
- High manufacturing tolerances: excellent yields

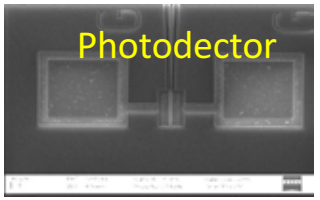






Fiber array attach





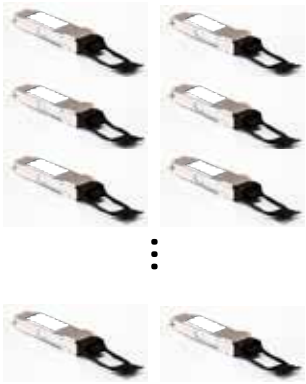
Integrated Functionality Captures Greater Networking Market Value

Switch ASIC

Packet processing, buffering and switching

Network Switch value

15%



Optical Transceivers

OEO inter-chassis connectivity and transport

50%

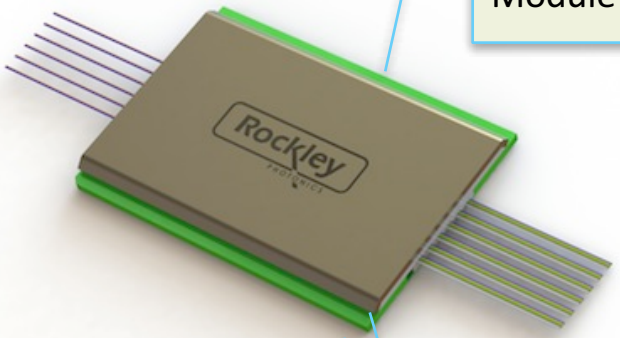
High-Speed Electrical Circuits & Backplane

Intra-chassis connectivity

15-20%

Capturing 80-85% of the switch value…

…in a $7B DC market for 100G switch ports in 2020



Optical Fiber I/O Network Fabric Switch Module

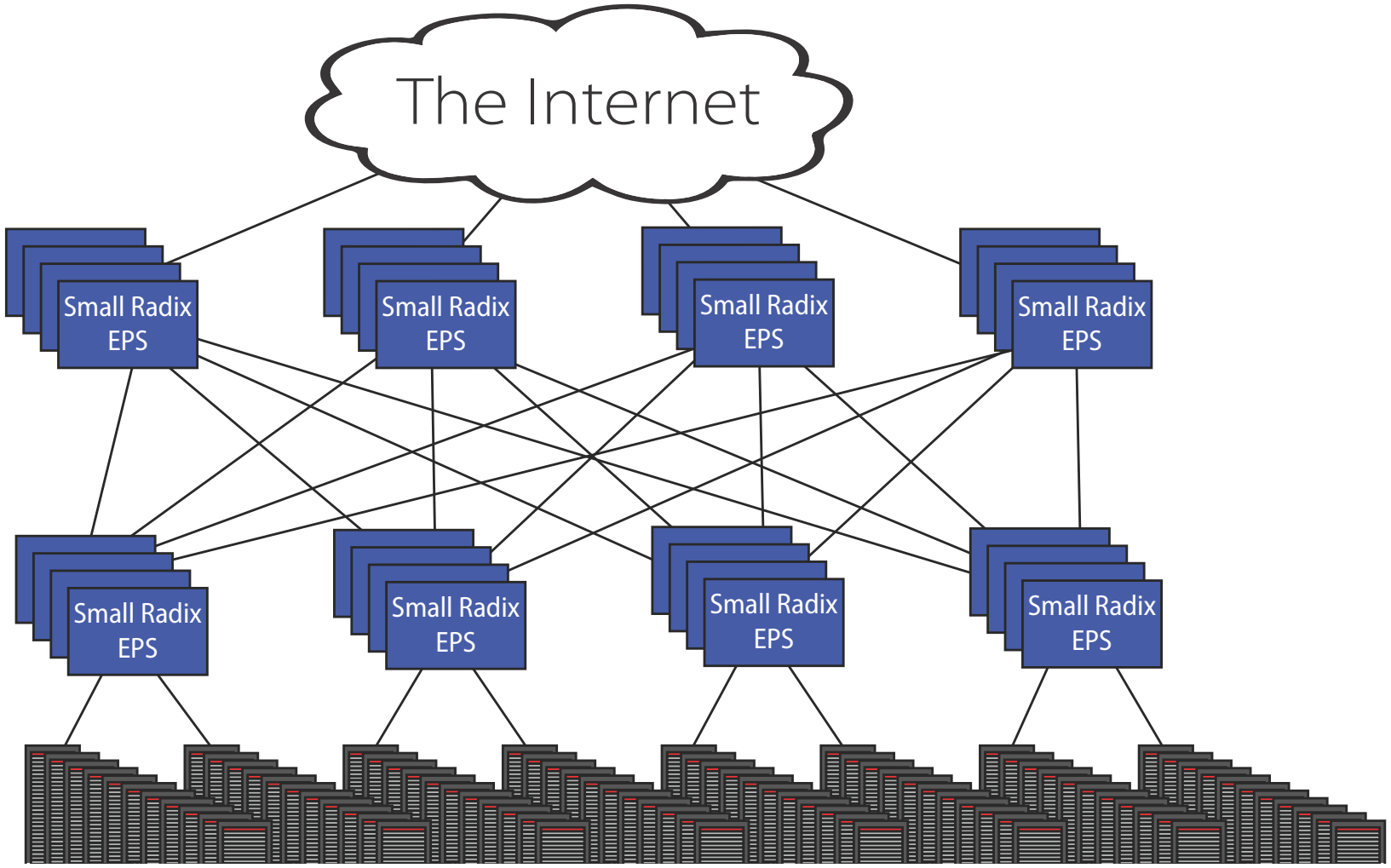
Rockley Photonics RPFabric CMOS Logic

or

Custom Partner CMOS Logic

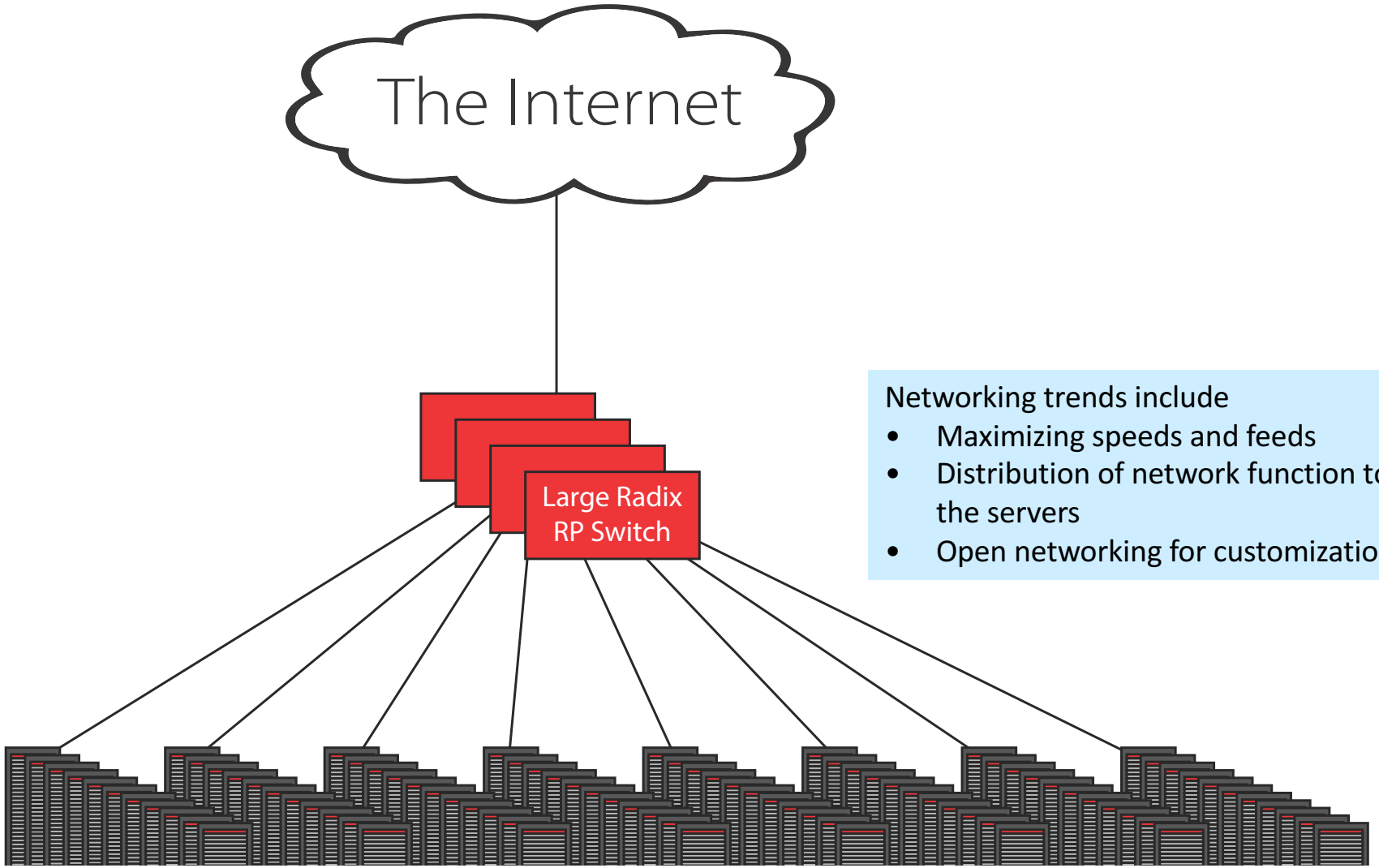
Traditional Data Center Network

Traditional switches are power hungry, costly and too small



Small-radix switches lead to a tall network

Data Center Network with Rockley Photonics' RPFabric Switches

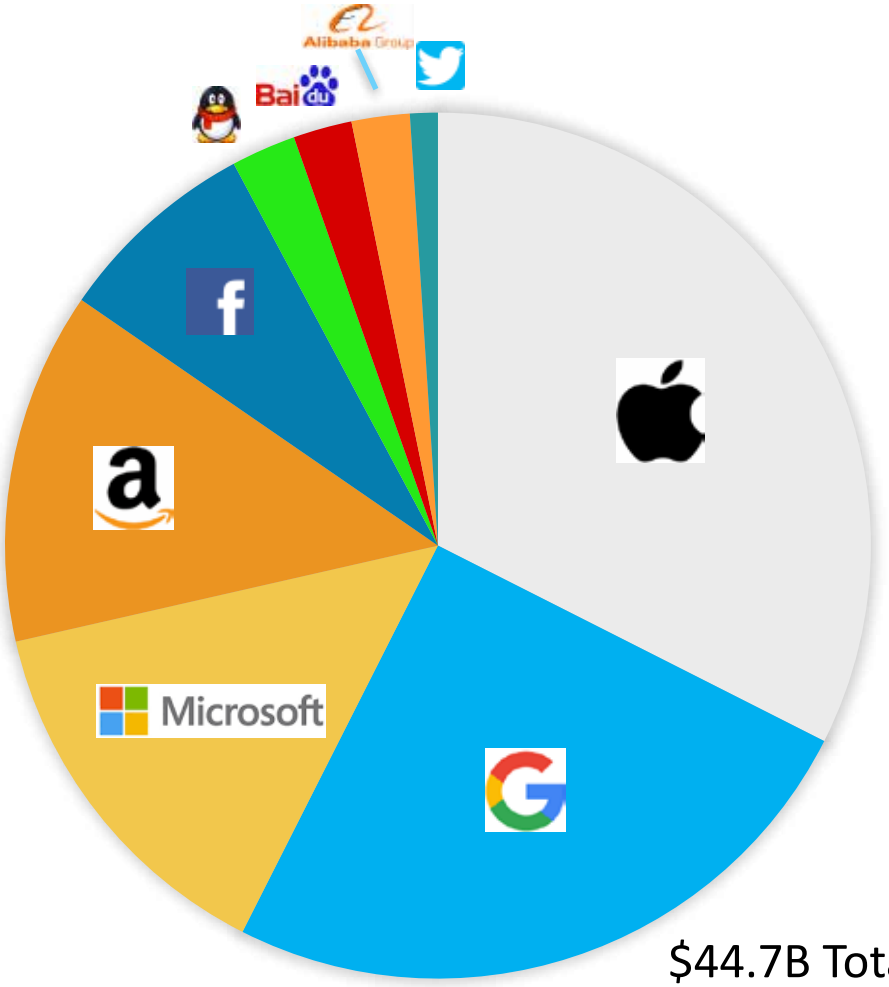


Networking trends include

- Maximizing speeds and feeds
- Distribution of network function to the servers
- Open networking for customization

Hyperscale Datacenter Operators	CAPEX 2016E /$bn
Apple	14.5
Google	11.2
Microsoft	6.25
Amazon	5.88
Facebook	3.39
Tencent	1.08
Baidu	0.98
Alibaba	0.97
Twitter	0.46

CAPEX Estimates 2016



$44.7B Total

Data centers represent a significant portion of these expenditure estimates, but the companies do not break out data center operations separately. *Source: FactSet, Nomura research*

Datacenter Networking Market Situation

Facing massive scaling requirements - networking does not follow Moore's Law

Over the last 10 years:

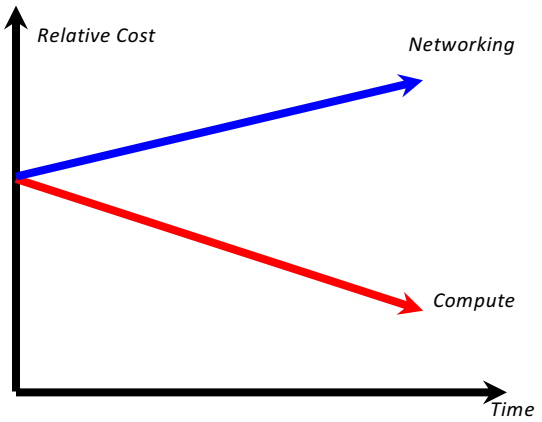
- the Internet has grown about 100x
- the compute capacity of datacenters has grown ~1,000x [1]

Moore's law continues to push down the cost of compute

- Lower compute costs lead to greater compute power being called upon for greater data analytics, evolving business models, etc.

Networking costs do not follow Moore's Law [2]

- Relative cost of networking is increasing with respect to compute



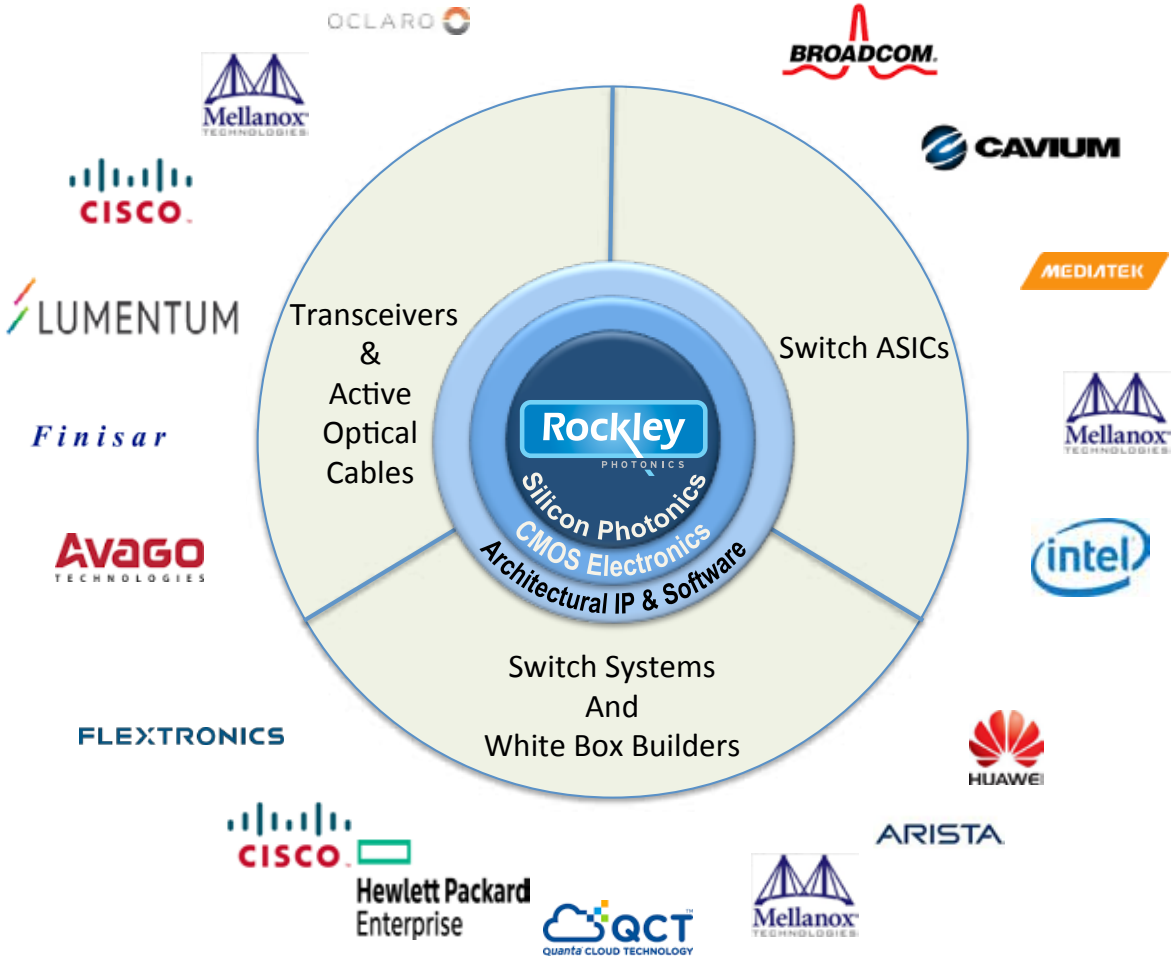
[1] Dorren et al, Journal of Lightwave Technology, Vol. 33, No. 5, March 1, 2015
[2] James Hamilton, AWSre:Invent, 2014

Many are left scratching their heads how a potential 1,000x increase in compute capacity in datacenters over the next 10 years will be addressed by networking. [1]

The Vendor Landscape

Rockley Photonics' unique network fabric solution crosses over a trio of current/legacy market areas and players in a highly dynamic and fragmented market space.

- Innovating across the boundaries will cause disruption and get us noticed
- Competition can be considered in each segment, but this is not fully relevant
- There is no direct competition to Rockley Photonics at the integrated solution level!



Original Work at University Surrey Leading to Today

- Professor Graham Reed's work at Surrey University demonstrates the feasibility of silicon photonics in early 1990s opening up the commercial opportunity

- Bookham Technology sponsored the research and PhD students (including Andrew Rickman) and goes on to commercialize silicon photonic

- Graham Reed's group leads the way in silicon photonics research and establish World class status

- Professor Graham Reed and Group moves to University of Southampton in April 2012 and begins working with Rockley Photonics in 2013

Rockley Photonics' Collaboration with Silicon Photonics Group and Photonics Hub at University of Southampton

1) World class SOTON team support silicon photonic device modelling, design, fabrication process of characterization

2) Work is focus on next generation functional element in silicon photonics, increasing optical data capacity on a silicon photonic chip

3) Key to the effectiveness of SOTON are:
   1) World class team that has longest experience in the field
   2) The cycle time for device fabrication.
      The Photonics Hub – focus on reducing fabrication cycle time

How Does Rockley Photonics Draw on the Silicon Photonics Group at SOTON

- Manufacturing hub collaboration (EPSRC-funded “Manufacturing Hub”) – under this program SOTON assists with research in manufacturing related activities relevant to the commercial targets of Rockley Photonics in terms of their device and system product developments.

- There is a mandate to retain flexibility such that work can target most relevant activities to RP whilst also maintaining fundamental aspects of research within university environment.

- Work includes developing SiP modulators, wafer scale testing, and fabrication and/or thermally tolerant multiplexers and demultiplexers for commercialization by RP, assisting in making prototype designs manufacturable, to ensure designs meet product specifications with sufficient margins in the presence of process variations and under increasing levels of integration.

How Does Rockley Photonics Draw on the Silicon Photonics Group at SOTON (continued…)

Example of work breakdown:

i. performing analysis and testing of device performance in the presence of process variations, corner conditions, critical to quality analysis

ii. develop and demonstrate device designs and process flows that are reliable and tolerant to manufacturing variations through fabrication and experiments, designing and fabrication short-loops and DOES and/or characterizing fabricated results, providing feedback and suggestions to RP based on results

iii. investigate new processing methods and materials to reduce sensitivity to manufacturing and improve performance margins

iv. Other innovative device designs or manufacturing processes that may improve reliability, manufacturability, or yield of devices and integrated circuits that RP can commercialize

Thank you!